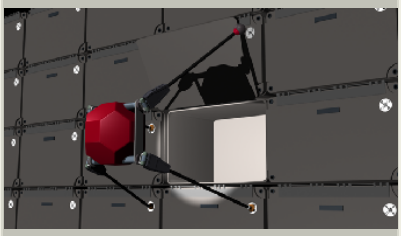
Robotic Interface DogTags for Autonomous Habitat Outfitting and Logistics, Phase I

Completed Technology Project (2017 - 2017)

Project Introduction

One of the key elements of NASA's future human exploration plans is the development of human-tended deep space habitats. These may serve as habitats during transfer from Earth to a destination (the Moon, Mars, etc), or serve as periodically-inhabited orbital bases. For all of these deep-space habitats, especially ones left in orbit around a destination planet or Moon, astronaut time at the habitat will be both infrequent, and very valuable. As such it would be extremely desirable to develop ways to enable robots to outfit the habitat prior to human occupation, and to allow robots to perform maintenance and logistics tasks both when humans are present and when they are not. These robotic interaction aids ideally can serve three purposes: 1) helping robots determine their relative pose and position with respect to the target, and their relative location/pose inside or outside the habitat, 2) identifying what the objects are, especially if the objects are mobile like soft-goods bags, and 3) simplifying physical interactions with the object, including anchoring to and manipulating the object. To enable these types of robotic interactions, Altius proposes the development of a lightweight, low-cost, passive "DogTag" robotic interface that can be attached to various habitat structures and objects. The DogTag interface includes: 1) a thin (<0.4mm) ferromagnetic material layer that allows robots with magnetic grippers to stick to the DogTag, 2) a printed on long-range optical fiducial on the DogTag face for allowing the robot to determine relative pose and position of the object even from across a large habitat, 3) an identification code and possibly RFID tag for identifying the object, also on the DogTag face, and 4) methods for attaching the DogTag to the desired object. During Phase I, Altius and team will define requirements, develop and test the optical fiducials and identification codes, and develop conceptual DogTag designs and prototypes, raising the TRL from 2 to 3.



Robotic Interface DogTags for Autonomous Habitat Outfitting and Logistics, Phase I Briefing Chart Image

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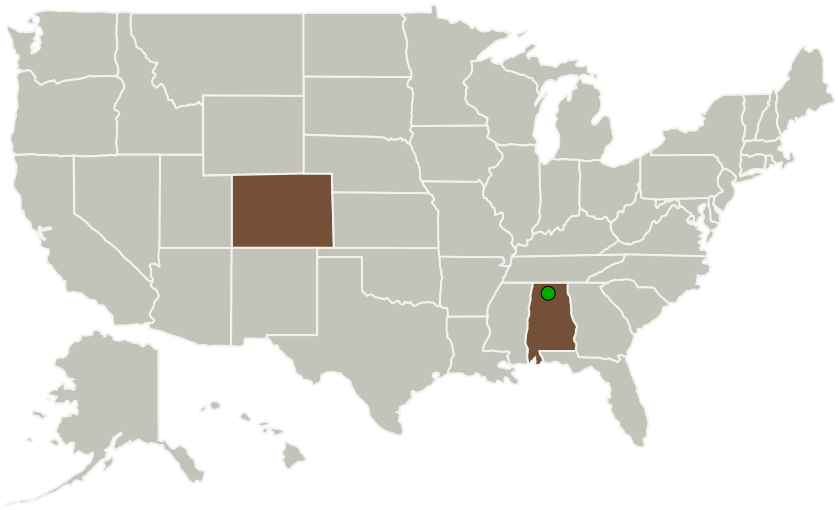
Primary U.S. Work Locations and Key Partners



Organizations Performing Work	Role	Type	Location
Altius Space Machines, Inc.	Lead Organization	Industry	Broomfield, Colorado
Marshall Space Flight Center(MSFC)	Supporting Organization	NASA Center	Huntsville, Alabama

Primary U.S. Work Locations	
Alabama	Colorado

Organizational Responsibility

Responsible Mission Directorate:

Space Technology Mission Directorate (STMD)

Lead Organization:

Altius Space Machines, Inc.

Responsible Program:

Small Business Innovation Research/Small Business Tech Transfer

Project Management

Program Director:

Jason L Kessler

Program Manager:

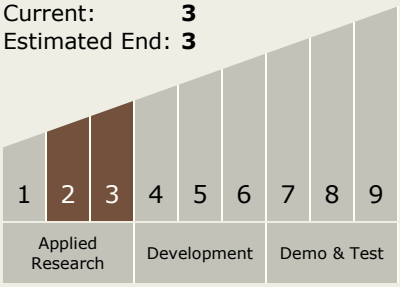
Carlos Torrez

Principal Investigator:

Jonathan A Goff

Technology Maturity (TRL)

Start: **2**
Current: **3**
Estimated End: **3**



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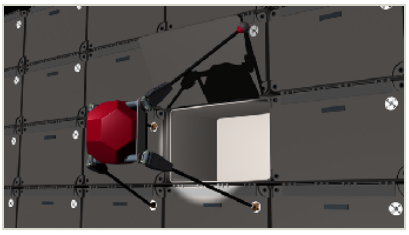
Images



Briefing Chart Image
Robotic Interface DogTags for Autonomous Habitat Outfitting and Logistics, Phase I Briefing Chart Image
(https://techport.nasa.gov/image/130197)

Technology Areas

Primary:

- TX06 Human Health, Life Support, and Habitation Systems
  - TX06.1 Environmental Control & Life Support Systems (ECLSS) and Habitation Systems
    - TX06.1.4 Habitation Systems

Target Destinations

The Sun, Earth, The Moon, Mars, Others Inside the Solar System, Outside the Solar System